Joint Probability Distributions

- Just like..... 2 way tables
- Except.... with probabilities in the cells instead of #'s
- One variable is... the row variable
- One variable is... the column variable

Example:

		Y			
		1	2	3	Total
X	1	0.32	0.14	0.19	0.65
	2	0.17	0.06	0.12	0.35
	Total	0.49	0.2	0.31	1

Y = column var.
takes values 1, 2, 3

X = row var.
takes values 1, 2

cells = 6 rows = 2
columns = 3

		Y			
		1	2	3	Total
X	1	0.32	0.14	0.19	0.65
	2	0.17	0.06	0.12	0.35
	Total	0.49	0.2	0.31	1

Let's look at X and Y separately:

For X, what is the probability distribution?

X	1	2	
P(X)	0.65	0.35	= 1

P(x=2) overall

P(x=1) overall

For Y, what is the probability distribution?

Y	1	2	3	
P(Y)	0.49	0.2	0.31	= 1

Questions:

1. P(X=1) = 0.65
2. P(Y=2|X=1) = $\frac{0.14}{0.65}$ = 0.2154
3. P(Y=2 ∩ X=1) = 0.14
4. P(Y=3) = 0.31
5. $P(X=1 \mid Y=2) = \frac{0.14}{0.2} = 0.7$

Now what if we have the following *independent* 2 variables:

X	1	2
P(X)	0.25	0.74

Y	1	2	3
P(Y)	0.18	0.42	0.4

We want to combine the two together, in a joint probability distribution:

	1	2	3	Total
1				
2				
Total				

- Write the...
- To fill out the cells of the distribution, just...
- Why can we just multiply the probabilities from the row and column totals to get the probability of the cell?